factors constitute the retainers, servants and domestic animals of the evolutionary household, but this does not give them places in the genealogy of evolutionary causes.

Dr. Ortmann is annoyed by incidental changes in familiar lines and stage directions, which he does not hesitate to charge to carelessness and ignorance, forgetting, for the time, that the whole play is being recast, and that the merits of the new rendering are to be judged by its conformity with the facts of nature, rather than by reference to the traditions of evolutionary literature.

O. F. COOK.

WASHINGTON,
July 18, 1906.

TEMPERATURE CORRECTIONS OF SUGAR POLARIZATION.

TO THE EDITOR OF SCIENCE: There has come to me a belated copy of SCIENCE (April 20) containing Dr. Wiechmann's review of my work on the polariscope, in which he discusses my treatment of the subject of temperature corrections of sugar polarizations. As Dr. Wiechmann seems to have quite misunderstood what I have stated concerning temperature corrections, in view of the great importance of the subject I have ventured to bring it again before your readers. Dr. Wiechmann takes a quotation from my book (p. 44) as to the fact that the values of temperature influence are well established [by Andrews, Wiley and Schönrock for instance] as a statement endorsing the use of temperature corrections in raw sugar polarizations. He quite overlooks the statement (on the same page, I think; I have no copy at hand) that such corrections can be *quite fallacious* if proper conditions are not observed; and yet further (p. 97?), under 'Errors of Commercial Polarizations,' where I say, that owing to other inherent errors of raw sugar polarizations it is doubtful whether application of such corrections brings any nearer approach to the true saccharimetric value; and hence, such corrections are questionable in raw products at least.

The present status of the case, as I understand it, is this:

It is well established that temperature change exerts an influence on sugar polarizations made according to standard method.

The quantitative value of such influence, when pure sugar is polarized, is known within narrow limits of error.

Owing to obscure compensatory errors, not yet possible of measurement and inherent in raw sugar polarizations, the correction of temperature influence is inadvisable as generally leading to an exaggerated sugar value. Further, application of temperature correction values gives quite fallacious results if the same constant temperature of solutions and apparatus is not maintained.

As the total errors or raw-sugar polarizations apparently come nearest to balance at 20° C. this temperature has been adopted as a rigid standard by the International Sugar Commission.

The fact that the International Commission has adopted a rigid temperature standard shows that the influence of temperature is recognized. It follows that polarizations made at temperatures other than 20°, as necessarily here in the tropics where the afternoon temperature is now from 28 to 30°, that some correction should be made for temperature influence, not to the standard, of 17.5°, but to 20°. The well-known case cited by Dr. Wiechmann simply emphasizes that 'temperature corrections' may be applied with quite fallacious results, without in any way casting doubt on the 'alleged' influence of temperature on the specific rotation of sucrose which obviously is but a small part of the influence of temperature on sugar polarizations.

Here might be raised the interesting and subtle question whether the sugar values of the saccharimeter standardized at 20° are identical with those of the instrument standardized at 17.5° when *raw* sugars are polarized.

In the whole discussion, what are facts of experiments in temperature influence on pure sugar polarizations must be carefully differentiated from what is the most consistent and fairest way to estimate the sugar value of a commercial product, by the indications of a method which at its best is subject to errors as

yet incapable of exact control; errors which are small but yet significant in the light of the magnitude of sugar transactions.

Geo. W. Rolfe.

Toa Baja, Porto Rico.

SPECIAL ARTICLES.

A BURIED TREASURE OF ECONOMIC ORNITHOLOGY.

In 1865 there was published in New York a work on entomology by Dr. Isaac P. Trimble. Though dealing primarily with insects, the book contains the most original and accurate observations then made in economic ornithology in America. Concealed under its caption, 'A Treatise on the Insect Enemies of Fruit and Fruit Trees,'[1] is a mine of information concerning the relations of birds to some of the worst pests horticulture has to endure.

The attention to minutiæ and the scientific accuracy with which the data were gathered are remarkable for the time, and the line of investigation, undeveloped as it was. While Samuels, Michener, Flagg, Bryant, Jenks and others were working in the field of economic ornithology at that or a little earlier period, the work of few, if any of them, is marked by the wealth of definite information that characterizes the labors of Trimble.[2] His specific identifications of substances found in the stomachs and his technique of determination savor strongly of present methods, and at once distinguish his work from most of the contemporaneous articles on the subject, being, as often they were, mere compilations of Audubonian and Wilsonian phrases.

Dr. Trimble went to the birds themselves for his information. He says:

I have killed a very large number of birds and examined the contents of their stomachs, especially of those frequenting orchards. Most of these examinations have been made with a magnifying glass, and many with the microscope. Some species I have shot at short intervals during the season, to know how far their food varied at different times; and I have thus ascertained that the contents of the stomach at any one time are not an infallible criterion by which we can determine the usual food of that bird. On the fifth of May, 1864, I shot seven different birds; they had all been feeding freely on small beetles, and some of them on nothing else. There was a great flight of these small beetles that day; the atmosphere was teeming with them. A few days after the air was filled with ephemera flies, and the same species of birds were then feeding upon these (p. 113).

Here he recognizes the law that birds as a rule feed upon substances most abundant about them, a fact with which we are constantly brought face to face in the more extensive investigations of the present time. Continuing the comparison, as we identify some beetles by the scutellum or chrysalides by the cremaster, he also had his little niceties of method, of one of which the following is an interesting description:

The eyes of most insects are wonderfully formed. They may be said to be compound eyes, each made up of many hexagonal lenses. If a comb of the hive bee, containing one or two hundred cells, could be photographed down to the size of the head of a pin, it would look somewhat like the eye of a beetle. Each eye of the Curculio contains about 150 of these lenses. The number in the eyes of butterflies, moths or dragonflies amounts to many thousands. In some microscopic experiments made last summer upon the eyes of plant lice from different trees and plants, it was found that the number of lenses in the eyes of these insects varied from every tree and plant. Each thus proved to be a distinct species, no matter how close the resemblance in other respects. Thus, should the rose bushes of the garden or a neighborhood be cleared of these pests they would not be reinhabited by those from other plants. While examining one of these aphides it brought forth a young one, and this in turn being tested its eye was found to contain the same number of lenses as the mother's. This peculiarity of the eyes of insects, and the knowledge of the exact number of these lenses in the eyes of each species, become

[1] William Wood and Co., New York, 1865, pp. 139, pls. XI. This title is not to be found in Coues's bibliography nor in any list of publications concerning economic ornithology. By entomologists, however, the publication is frequently cited sometimes even for its ornithological matter, and its author is deemed entitled 'to a prominent place with the early economic entomologists of the country.'

[2] The latter says, however, of the work of Flagg, 'Of the many contributions to the history of birds, I have met with none so interesting as this' (p. 113).